FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 681. (No. 2, Vol. XIV.) JANUARY 12, 1922 [Weekly, Price 6d. Post free, 7d.

Flight,

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C. 2

Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828

Annual Subscription Rates, Post Free:

United Kingdom .. 30*s.* 4*d.* Abroad .. .. 33*s.* 0*d.**

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates

* *European subscriptions must be remitted in British currency*

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

1922.

Jan. 19 .... Lecture, "Aeroplane Installation," by Brig.-Gen. R. K. Bagnall-Wild, before R.Ae.S.
Feb. 2 .... Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
Feb. 7 & 8 Second Air Conference at Guildhall
Feb. 16 .... Lecture, "Methods of Instruction in Aeroplane Flying," by Sq.-Leader Portal, before R.Ae.S.
Mar. 2. .... Lecture, "Testing Aircraft to Destruction," by W. D. Douglas, before R.Ae.S.
Mar. 26–April 2 Nice Meeting
Mar. 30 .... Lecture, "The Design of a Commercial Aeroplane," by Capt. de Havilland, before R.Ae.S.
July 6–20 French Gliding Competition
Aug. 6 .... Gordon-Bennett Balloon Race, Geneva
Sept. .... Tyrrhenian Cup, Italy
Sept. .... Italian Grand Prix

EDITORIAL COMMENT

ONE of the most amazing attacks which has ever been made on the organisation of the Royal Air Force was launched in the *Pall Mall Gazette* on January 5, when that journal announced in glaring head lines and "shouted" from its placards that there is "Chaos in the Air Force," that the "Present state of the Force is a National Peril," and that "The aerial Defence of the Country is a Plaything of the 'Military Dictatorship.'" Those who, prompted by curiosity, waded through the mass of allegations most of which were alleged to be made by "one of the highest authorities" or "a distinguished officer," found Captain Guest swept aside as little more than a political chief, Sir Hugh Trenchard described as the "Dictator of the Air Force," the internal organisation of the R.A.F. referred to as thoroughly unsatisfactory, and the whole atmosphere as bad. The last epithet appears peculiarly apt in relation to the article itself, the atmosphere of which is so bad that one fails to grasp the sequence of the whole thing.

A Curious Attack on the R.A.F.

Most of the statements made are gross exaggerations, others are pure mis-statements of fact, while others again are merely ludicrous. The general impression left after reading the effusion is that it is partly due to some disgruntled R.A.F. or ex-R.A.F. officer (and not such a very "distinguished" one either, we imagine), and partly to some string (or leg ?) pulling by someone at the Admiralty.

It has long been known that forces are incessantly at work at the Admiralty with the object of overthrowing the single Air Force, and re-instating a separate Naval Air Service. We have repeated so insistently for years the fallacy of that policy that there is no need to enter into the pros and cons. again now. These efforts are merely the manifestations of the nervousness of an obsolescent Service which sees its existence threatened.

To deal but briefly with some of the statements made: With regard to the personal criticisms of Sir Hugh Trenchard, little need be said. The loyalty of the Royal Air Force is not likely to be shaken by such attacks. Sir Hugh is too well known and (but for those inefficients who have found him a strict chief) well liked to be affected by remarks

which obviously come from some one with a supposed grievance. As to the "Military Dictatorship," Sir Hugh Trenchard is, admittedly, an old Army officer, but has he ever let his better acquaintance with the Army override the claims of the Navy? Frankly, we think not. If proof were needed it may be adduced from a list of ex-naval officers who hold important posts in the R.A.F., compiled by Major Blake and published in the *P.M.G.* of January 6. It is sufficient, without going into details as to the posts held, to mention the names: Air-Commodore Steele, Commodore Briggs, Air-Commodore Lambe, Air-Commodore Swann, Air Vice-Marshal Vyvyan, Air-Commodore Scarlett, Group Captain Clarke Hall, Air-Commodore Masterman, Air-Commodore Samson and Wing-Commander Cave-Brown-Cave. All of these officers, with naval records, hold important and responsible positions. Is that an indication of Military dominance? Moreover, it may as well be stated for the benefit of those who are not aware of the fact, that while the squadrons working with the Army have had to use war types of machines, the Navy has had up-to-date machines, designed and built since the Armistice. Does that indicate that the water-tight compartment Navy is being treated as a Cinderella as regards *matériel*? The whole truth of the matter is that the Admiralty has practically and persistently refused co-operation with the R.A.F., generally on the flimsiest of grounds, as, by way of instance, that the officers could not be spared (for training) so long away from the sea.

As regards the allegations of lack of organisation: When the end of the War brought about an enormous reduction in the Army and Navy as well as in the R.A.F., an entirely new organisation had to be planned. It is inevitable that in the consequent upheaval mistakes might be made. Were none made by the Army, or even by the infallible Navy? There was this difference, however, that in the Navy there were centuries of experience and precedent to draw upon. Sir Hugh Trenchard was faced with the enormous difficulty of having to *create*, where the wiseacres at the Admiralty had merely to see what their predecessors did in the past under similar circumstances and carry on for another few decades as before. As we have said already, mistakes may have been made in the initial stages of R.A.F. organisation, but taking it as a whole we think there has not been much with which to be dissatisfied. Upon occasion, we have in a friendly spirit crossed swords with Sir Hugh Trenchard, and shall no doubt do so again when necessity arises, but the indiscriminate allegations in the *Pall Mall Gazette* are upon a totally different plane, are an outrageous travesty of the facts and not worthy the reputation of a newspaper with so great a past.

Major Blake, in his communication against the attack, makes several excellent points, such as, for instance, with regard to the allegation that the *esprit de corps* of the R.A.F. has almost disappeared. He says: "A 'Distinguished Officer' who deplores the lack of *esprit de corps* and then attacks the service to which he belongs is certainly not competent to criticise."

Some of the statements made are merely ludicrous. For instance, "At all times the influence of inefficient officers is bad." Precisely. This has upon occasion been found to be so, even in the Navy. And it was realised by the R.A.F. when the time came for reductions. Hence they were allowed to leave the R.A.F. and to become "distinguished officers" lamenting the lack of *esprit de corps*, and the lack of appreciation in a chief who simply would not see what excellent fellows they were. "Many accidents have been due to ignorance." There is a volume of deep thought behind that statement. When the bows of a destroyer cave in because the ship is too hard pressed, it is not due to the ignorance of the designer in failing to get his stresses right. Surely not. It cannot be ignorance, because the designer was an Admiralty man, and therefore omniscient. And so the supposed "chaos" meanders on until it arouses doubt even in the uninformed by its very absurdities.

In the same issue of the *P.M.G.*, Rear-Admiral Sir W. R. Hall makes a plea for single control of the Navy and its air arm. On the whole, the claims of the gallant Admiral are moderately stated, and at any rate they are straightforward and honest. That they come from a retired officer of a service which promises to become in time obsolete amply explains the views expressed. One may take it that the gallant Admiral has not had the opportunity of obtaining a very intimate knowledge of the "air arm," and hence he cannot be expected to see the matter other than from the restricted and purely Naval point of view. His statement that "the present scheme does not work" (with the Navy) is already answered by the fact that its alleged failure to work is entirely due to the hostility of the Admiralty and its refusal to give it a chance to prove that it will work. He contends that it will be a long time before aircraft will be in a position to keep the seas without the assistance of the Navy. Perhaps, and perhaps not. But on the other hand it will certainly not be long, if not already here, before the Navy will be totally unable to keep the seas without the assistance of the "Air Arm."

An R.A.F. Rejoinder

The article in the *P.M.G.* has drawn from Sir Cecil Lambert, Director of Personnel, R.A.F., an extremely able defence, during which Sir Cecil refers to a few only of the things accomplished by the R.A.F. since the Armistice. Sir Cecil, it will be remembered, was Fourth Sea Lord in 1913, and as such was responsible for drawing up the organisation which was adopted for the R.N.A.S. As he says, "the Navy as a whole did not take kindly to the Air Force at its inception, and even after war broke out rather despised than encouraged it. Finally, in 1917, the then Board of Admiralty threw the whole thing overboard, and in the spring of the following year the separate Air Force came into being, and *supremacy in the air was at last attained.*" The italics are ours, and comment is, we think, superfluous. There we have, in a nutshell, the whole story of the Navy's attitude from the commencement, and incidentally proof of the fallacy of letting the Navy again run its own air service.

Sir Cecil says, with regard to the alleged failure of the "Naval partnership" or co-operation between the Navy and the R.A.F.: "There are practically no Naval officers with any knowledge of airmanship, but this is in no way the fault of the Air Ministry. The Admiralty were asked to lend or have a quota of officers seconded each year for four years' training in aviation. The offer was refused on the inadequate ground that naval officers could not be spared so long away from the sea; on the other hand, arrangements have been made for ensuring that Air Force

LONDON-PARIS FROM THE AIR, AS SEEN FROM A HANDLEY PAGE MACHINE:

No. 22.—*Top:* Le Touquet; *Below:* The French Coast near Etaples.

personnel shall remain with the units employed in co-operation with the Navy for a period of four years, and thus efficiency is secured." At whose door must the failure of the partnership be laid? Certainly not at that of the Air Ministry.

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And Second Thoughts

After its first violent attack on the organisation of the R.A.F., the *Pall Mall Gazette* effects a complete, and not very graceful, *volte-face*. It proceeds to complain of the neglect of the flying services, refers to them as "our first line of defence," and sounds, in an article by Lieut-Col. C. R. Finch-Noyes, D.S.O., late R.A.F., a warning note on the danger of neglecting the R.A.F. While we are spending approximately £2 per head per annum of the total population on the Army and £2 on the Navy, we are spending 8*s*. 5*d*. only on the Air Force. It is refreshing to find Col. Noyes filling the breach to enable the *P.M.G.* to set itself right again, but certainly nobody could adduce, from the first article, that this was what the *P.M.G.* was driving at. If we have misread the original article, then it is evident the methods adopted by the *P.M.G.* to plead for the future of the Air Force were most chaotically conceived. There was a great chance to help a great national cause which, by bad handling, ignominiously failed. The sincerity of its later-day apologies is not very satisfying.

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Aircraft Carriers at Washington

It is a matter for the greatest satisfaction to be able to record that the agreement reached at Washington in the matter of aggregate tonnage allowances for aircraft carriers is materially different from Mr. Hughes' original proposals. These were, it may be remembered, that the United States and this country should each be allowed aircraft carriers aggregating 80,000 tons, while Japan was to be allowed 48,000 tons. The clause about replacements, however, placed this country in a very unfavourable position, as we already have approximately the prescribed tonnage, while the U.S. and Japan have nowhere near that to which the proposal would entitle them. Consequently, while the U.S. and Japan would have been free to construct up to the limit of their allowance, we should have had to stand by and watch them benefitting from our past experience, while we were unable to make progress under the hampering clause. As actually reached, the agreement is not only much fairer to us, but the aggregate tonnage has, for all three countries, been nearly doubled. This is all to the good, since the problems relating to aircraft carriers are so novel that to limit the tonnage to 80,000 tons would mean seriously hampering development.

Under the new agreement, however, Great Britain and the United States are each to be allowed an aggregate tonnage of 135,000 tons, and Japan 81,000 tons. Also, the aircraft carriers have been exempted from the restriction of the ten years' holiday and replacement conditions applying to other types of ships. It therefore seems as if each of the Powers is practically free to construct modern aircraft carriers up to the limit of their allowances. The only point on which it appears that any controversy can arise is the interpretation of the term "obsolete experimental tonnage," which, according to the agreement, may be replaced. The development is so rapid that an aircraft carrier is really always experimental, and it is almost obsolete before it is completed. In this country all the aircraft carriers, with the exception of the "Hermes," which is still building, have been converted into aircraft carriers from cruisers, liners, and battleships. Apart from the "Hermes," which is quite a small ship (11,000 tons), and well below the maximum of 27,000 tons for individual carriers, the majority of the others are certainly to be considered as obsolete experimental, with possibly one or two exceptions. The amount of new tonnage to which this country would be entitled will therefore be considerable, while the other countries, starting practically from rock bottom, will have available for new construction almost their whole allowed tonnage.

From the point of view of national policy, this is highly satisfactory, showing as it does that an increasing importance is being attached to the use of aircraft in co-operation with the Navy, while as regards the aircraft industry, with which we are directly concerned, the building of aircraft carriers necessarily means also the building of aircraft, and hence one more step towards that aerial preparedness which will in the future be our best guarantee of peace.

• • •

Mapping from the Air

Apropos recent discussions relating to surveying from the air, Professor Melvill Jones has a long letter in *The Times* detailing certain difficulties which have been encountered in securing accurate data from aerial photographs. In particular, he draws attention to the inaccuracies consequent upon different angular positions of the camera when the photographs are taken. Experience has shown, he says, that the required order of accuracy is not generally attainable when the aeroplanes are flown by pilots who have not been specially selected or trained for the work. It is true that even when large unknown tilts occur it is possible to calculate these tilts accurately by a method known as resection—that is, to calculate the tilts from the position of the plates of known ground marks that have been accurately surveyed independently. This method is being developed, but it is thought that it will involve the fixing of too many points by independent ground surveying, and that it requires too much office work to be commercially successful except in special cases.

All of which sounds not especially hopeful for the future of surveying from the air. Commander Boothby, however, scores a distinct point in another letter to *The Times*, in which he says that if Professor Jones could persuade the Air Ministry to allow him to repeat his experiments, using an airship, his difficulties would be easily overcome. An airship, he points out, can place herself vertically over any desired position and stay there. The work of the observer with the camera is thus rendered more simple than when he is hurtled over the spot at 80 miles an hour in an aeroplane, even when in charge of a specially selected pilot. Commander Boothby concludes: "Thanks to the Air Ministry policy, all our airships are now rotting in their sheds, but I have no doubt that the Germans will be pleased to assist Professor Melvill Jones in the very near future, if no British airship can be provided." Bitter, but nevertheless too true.

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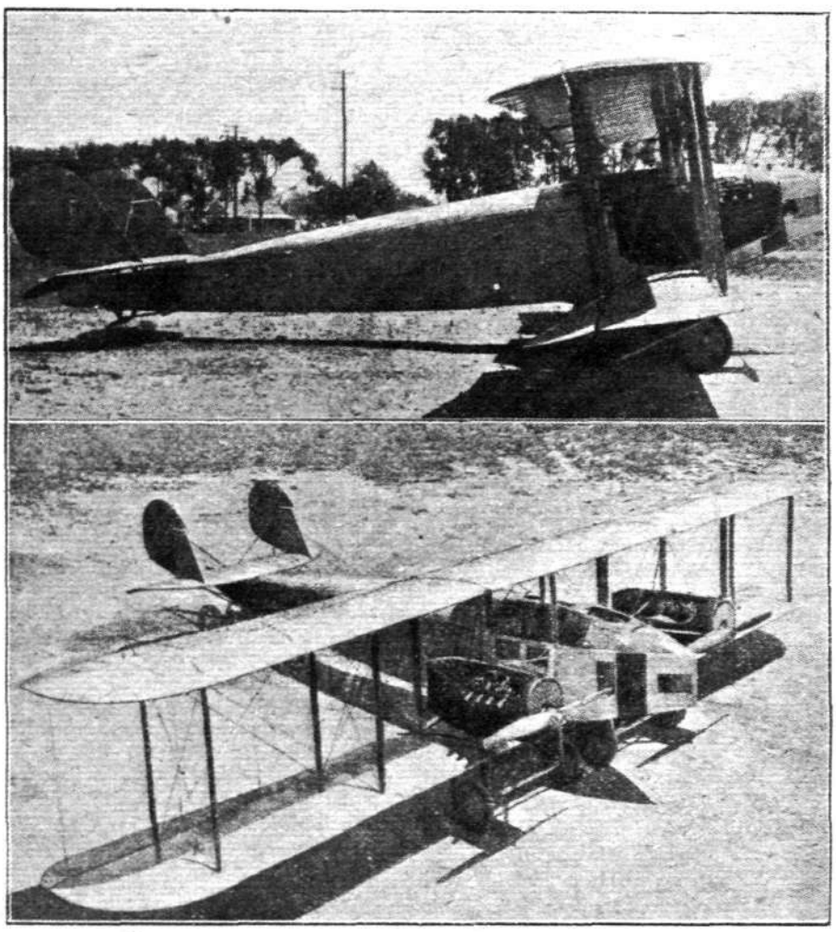
THE BARNHART TWIN 15 "WAMPUS-KAT"

EVEN if the aviation industry is in a bad way out in the "States," as their reports have it to be, they have one advantage over our own state of affairs, and that is, there appear to be plenty of firms in a position to turn out new and experimental machines of various types, both for Government and commercial purposes. Within the past few months we have seen particulars of or references to about a dozen different new American machines of more or less original design.

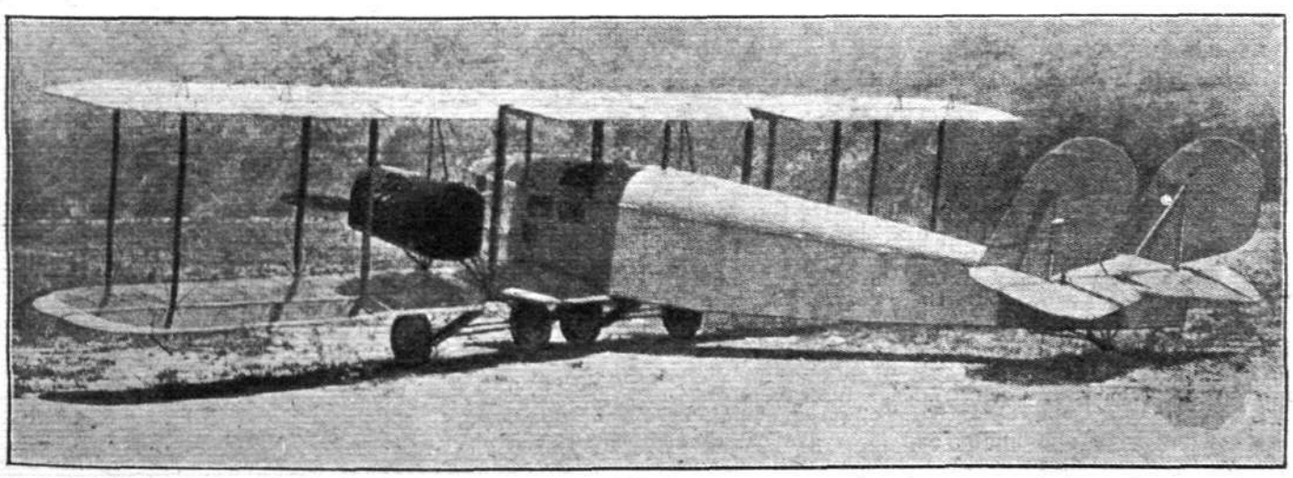
One of the latest of these is the Barnhart Twin 15, "Wampus-Kat," a medium-sized, moderate-powered twin-engined commercial biplane, a product of the C. R. Little Aircraft Works, of Pasadena, California. The design of the "Wampus-Kat" is the result of some months' study and planning on the part of G. E. Barnhart, with the financial assistance of C. R. Little, a retired business-man and aviation enthusiast. The main planes are of equal span and chord, without stagger or sweepback, and are of the folding type. The folding operation takes very little time, and is accomplished by releasing four lock pins and four master pins. Dummy or auxiliary struts are provided which properly space the upper and lower planes in relation to their fittings. There are also provided spacer bars, which tie the wings, when folded, to the *fuselage* at the rear outer struts.

During the tests the machine, with the wings folded, was towed over very rough ground at 30 m.p.h., and there was no shake to the wings, nor was any alignment or tightening of wires required. It was also towed through streets and traffic with the wings folded back, and after arriving at the flying field, the machine only required a matter of minutes to make ready for flight. The hinge on which the wings turn is a universal joint, so that there is little likelihood of it being overloaded due to any angularity of the wings or deflection of the spars. With the wings folded the engines are exceptionally accessible.

There are seven wing panels; a top centre section extending from port to starboard engine mountings; two lower centre sections running from *fuselage* to engine mountings; and the four upper and lower outer panels, which are of the same shape and size. The wing section employed is R.A.F. 6A. The struts form a three-bay system with lift wires double and landing wires single; between the *fuselage* and engines all wires are duplicated. The main spars are of hollow box girder construction, with block external and internal strut points. These blocks are all properly tapered so as to allow the bending stress being brought in gradually to the strut points. The ribs have spruce webs with lightening holes and reinforcement for horizontal shear. The attachment to the spar is by U shear blocks, which relieve the cap strips of vertical shear load. Cap strips are of spruce with a groove for the ribs. All internal and external fittings are mild steel, of clean cut simple design for ease of production. The wings are internally braced with double steel wires and adjustable turnbuckles. All external strut fitting bolts straddle the spar, and are prevented from sliding by special blocks and bolts through the neutral axis of the spar, which gives the fittings a permanent tie. Where the wings join the *fuselage*,



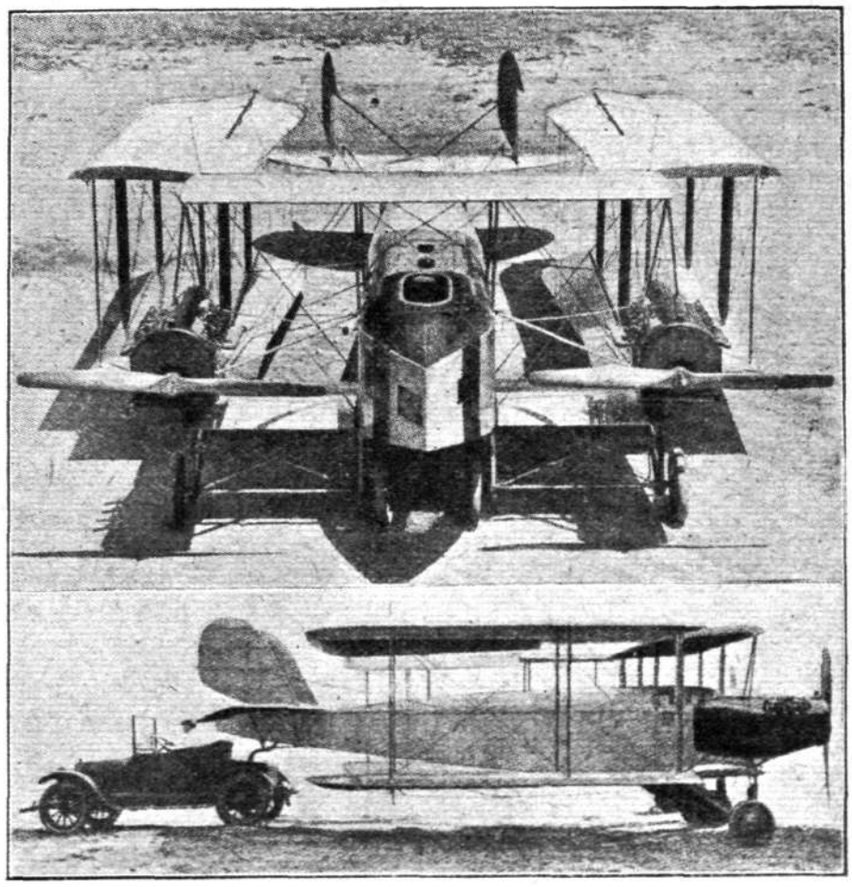
THE BARNHART TWIN 15 "WAMPUS-KAT." Side view (top) and three-quarter front view from above.



THE BARNHART TWIN 15 "WAMPUS-KAT." Three-quarter rear view.

or each other, there are pin joints parallel to the neutral axis of the spars. The covering is grade A linen, sewn on to the ribs, and given six coats of dope and three coats of Cosmolac varnish. *Ailerons* are hinged to both upper and lower planes.

The *fuselage* is of rectangular section, and is well stream-lined. In its design an effort has been made to maintain consistent and uniform strength throughout, and special attention has been paid to the ease and quickness of effecting repairs. It is built up of four ash *longerons*, with spruce struts for transverse and vertical members, the whole structure being trussed with steel wire and adjustable turnbuckles. The floor and dome of the pilot's and passengers' cabin is of mahogany three-ply wood with natural finish. Accommodation for four persons is provided for in the passengers' cabin, the seats being readily removable, which enables the number of passengers or goods to be carried to be arranged as desired. Ventilation doors are provided in the dome of the cabin in addition to a large emergency door. Two side windows are provided for each passenger, and in the floor ahead of the passengers is a large negative observation lens through which all the passengers may view the ground. Ample room is provided as the floor space is 6 ft. by 3 ft. 8 ins., and at the rear of the seats is a space for luggage. The pilot's cabin is in the nose, forward of the passengers. For vision the pilot has three side windows, and one in the floor, whilst, in addition, he can see above him through the opening in the dome. Entrance to the cabins is through the floor in the nose of the *fuselage*. All control wires and attachments are protected against the catching of clothing or jambing by passengers or goods. The outside of the entire *fuselage* except the cabin dome is fabric covered; the fabric is laced on to the *longerons* and struts on three sides of the *fuselage*, bottom and sides, the top being a detachable turtle deck. The *fuselage* is large enough for a man to work inside making any adjustment, and with the laced fabric and breaker strips he can open any portion that might require repairs.



THE BARNHART TWIN 15 "WAMPUS-KAT." Two views of the machine with the wings folded for transport.

Special "Dep." control is employed for elevators, *ailerons* and rudders, and the engine controls—duplex throttle spark retard, and switches—are within easy reach of the pilot. All instruments—one for each engine of the following: tachometer, oil pressure gauge and thermometer—are mounted in full view of the pilot.

The landing gear is of the four-wheel type, and is exceptionally strong. Two wheels are mounted below the *fuselage*, and one under each of the engines, the inner and outer wheels being connected by a tubular steel axle. The construction is of wood and steel. Each wheel is carried by a U of nine lamination ash, 2½ by 2 ins., streamlined with a hollow spruce fairing. The entire strut assembly is wrapped with linen treated with dope and natural varnished surface. Steel spools with side thrust and ground friction arms are used on which to wrap the rubber absorber cord, and guard or check cables allow the latter to absorb up to six times the weight of the machine. Any additional load in landing is transmitted direct to the struts through the cables. The front members of the inner and outer U's are connected by tubular steel tie-rods, and braced by double steel cable, the rear members being braced with single cables.

The engines—which are, we believe, 90 h.p. Curtiss eight-cylinder V-type—are mounted on steel tubing beds with wood vibration breakers and with V-type bracing having all ends pin jointed. By removing six main pins, the cowling, radiator and engine may be withdrawn as a complete unit—an important feature in connection with commercial air services. The main engine bolts do not pierce the tubing bed, being rings with studs. The radiator is supported by a felt pad, and is tied from the top to prevent fore and aft movement. As a safeguard against fire all structural members are of steel with the exception of the wood vibration strip. The entire cowling is of aluminium, and is in five detachable sections. It is possible to work around any particular part of the engine with ease, and without removing any but the one section of the cowling. These sections have the hinge joint type connections, which will take up all wear and not allow the cowl to become loosened.

In order to minimise the danger arising from fire, the main petrol tank is carried below the *fuselage*. From the main tank the petrol is delivered to two centrifugal pumps, which force it under pressure to a main control box in the *fuselage*, thence to the desired engine gravity tank. By means of this control box petrol may be delivered at any pressure or by gravity. The petrol system for each engine is entirely separate. For long distance flights extra petrol can be stored in the *fuselage* in 5-gallon cans, and poured into the main tank through the filler whilst in the air; in ordinary filling, petrol is poured into the tank from outside the *fuselage*. All pipe-line connections are of the olive and special fabric-lined moulded rubber hose.

After the trials of the "Wampus-Kat," G. G. Budwig, the test pilot, gave the following report on its general performance. The machine is very easy to fly, take off and land. It flies naturally, and is very stable. But little control is necessary at any time, even in rough air, and it makes natural turns to either right or left, and makes them equally well flying level or in a climb. When stalled the ship recovers quickly, and settles slowly with no tendency to spin or fall violently. The horizontal balance is the same whether loaded or empty, flying level or gliding; the addition of load does not apparently change her climb to any great extent. The glide is good, and she keeps her speed at a small angle. The general controllability under all conditions is excellent. When one motor stops or is shut off abruptly, the machine turns toward the dead motor very slowly, and there is ample time to stop all turn with the rudder.

It flies level on one motor at 2,400 ft. with 90 gals. of fuel and one passenger, at 1,500 ft. with same fuel load and two passengers. (This with the engine revs. at 1,300, about 100 under normal, due apparently to unsuitable airscrews.)

The principal characteristics of the "Wampus-Kat" are:—

Span	50 ft.
Span with wings folded	22 ft.
Chord	5 ft. 5 ins.
Gap	6 ft. 8 ins.
Overall length	30 ft. 10 ins.
Overall height	11 ft.
Dihedral angle	1°

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Wing section	R.A.F. Mod. A.
Total area wings (including *ailerons*)	484.9 sq. ft.
Area of *ailerons* (4)	41.25 sq. ft.
Area of tail plane	36 sq. ft.
Area of elevators (2)	23 sq. ft.
Area of fins (2)	10.30 sq. ft.
Area of rudders (2)	19 sq. ft.
Total h.p.	180
Weight of machine empty	2,611 lb.
Weight of machine fully loaded	4,015 lb.
Weight of fuel and oil (4½ hrs.)	540 lb.
Weight of pilot and four passengers	800 lb.
Weight/sq. ft.	8.23 lb.
Weight/h.p.	22.3 lb.
Speed range (sea level)	45-90 m.p.h.
Climb in 10 mins. (full load)	3,500 ft.
Ceiling	11,600 ft.

THE WIBAULT NIGHT BOMBER

An Interesting French All-Metal Aeroplane

AMONG the examples of metal construction found at the recent Paris Aero Show, there are few which could be said to show real merit. Either they were too costly in manufacture, unsatisfactory in design, or of very inferior workmanship. Exceptions there were, of course; and first and foremost among these was the Wibault all-metal night bomber, "B.N.2." Unfortunately, this machine was not exhibited complete, but from a specimen wing shown on the Duralumin stand, it was possible to form a very good idea of at least the wing construction. In view of the good workmanship, it was not surprising to find that the wing—and indeed the whole machine, which was at the time of the Show undergoing its acceptance tests—was built by Pierre Levasseur, whose workmanship is always a joy to behold.

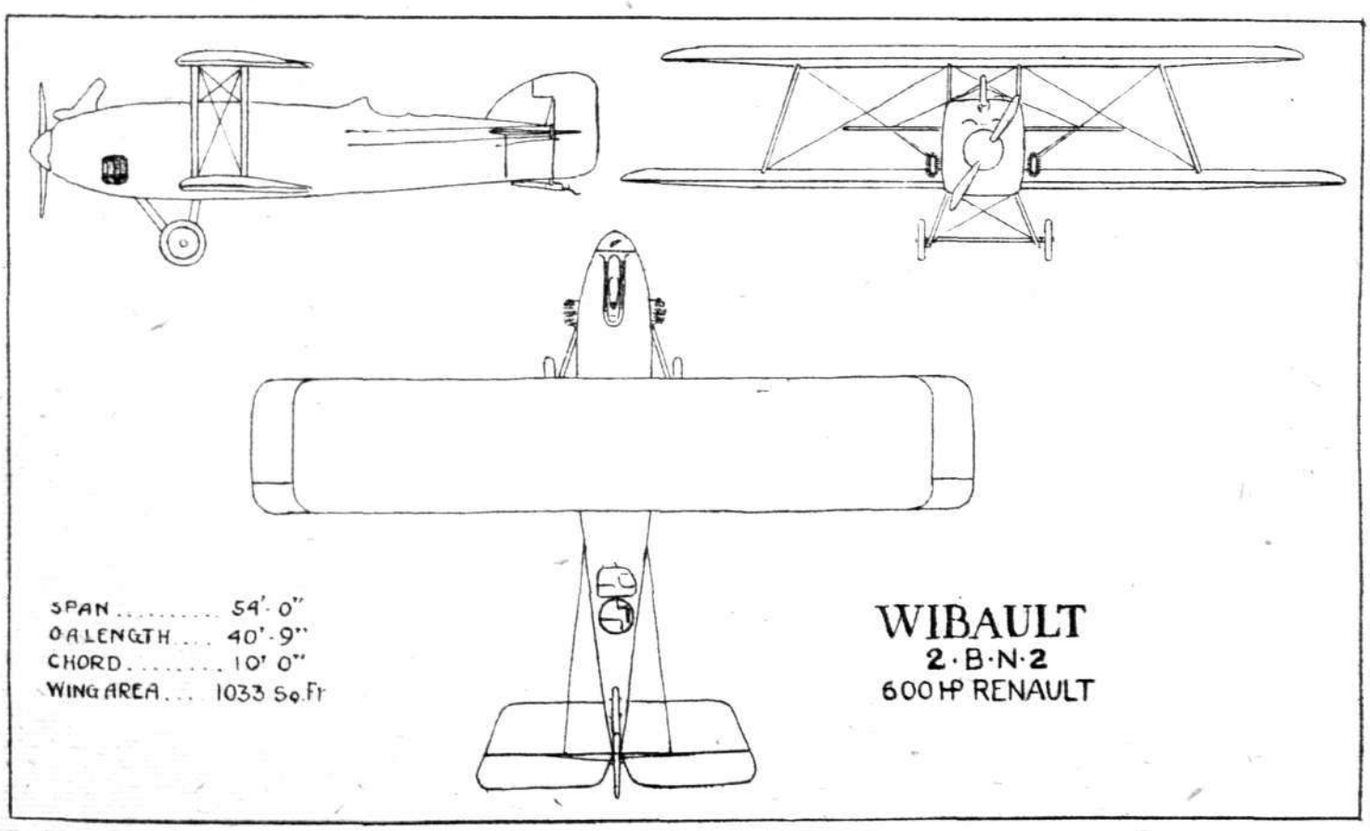
A set of excellent photographs on the Pierre Levasseur stand showed the general lines of the Wibault "2 B.N.2." Unfortunately, we have not been able to obtain good photos. of the machine, but the accompanying general arrangement drawings should indicate the general lines.

As the letters "B.N." indicate, the machine is intended for night-bombing, although it is claimed that it could be modified for commercial work, if desired. As a result, it is claimed, of the metal construction, it has been possible to effect a great saving in the structure weight of the machine, which forms a relatively small percentage of the total weight. The engine fitted is a 600 h.p. Renault, which naturally weighs a good deal. Nevertheless, the weight of the machine empty, but with cooling water, is only 4,620 lbs., while the total loaded weight is 9,450 lbs. The useful load, which in this case does not include tanks and fuel, is 3,100 lbs. Sufficient fuel is carried for a four hours' flight at full throttle.

Apart from this feature of small structure weight, the "Wib. 2, B.N.2" is chiefly remarkable for the fact that its wings are placed very far aft on the *fuselage*, and that, in spite of its comparatively large size, only one pair of struts is employed on each side. Another remarkable feature is that the upper plane is of shorter span than the lower.

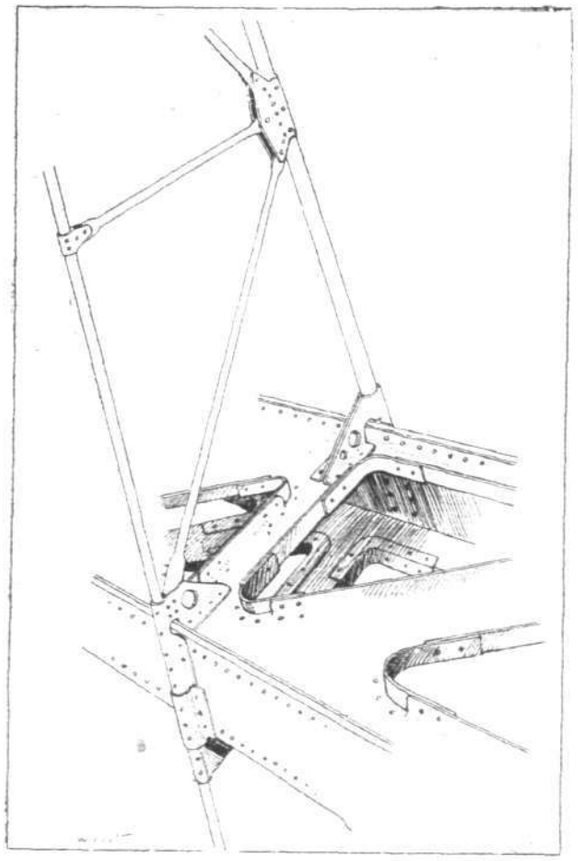
To deal with the various features in the order enumerated, the placing of the wings has probably been decided upon as a result of the necessity of centralising as much as possible a heavy load of varying weight. With such a long cargo space, there is a possibility of so arranging the load—in this case bombs—that by dropping the central ones first and then, working towards front and rear simultaneously, the others in sets from front and rear, the trim is not seriously upset. Large space is required, and in the Wibault this has been attained by spreading the bomb chamber in a fore-and-aft rather than in a lateral direction. Also, for night-flying, it is possibly an advantage to have the crew placed far aft in the *fuselage*, where the view downward is but little obstructed. For use as a commercial aeroplane, which the designer may have had in mind, the central placing of a large cabin or cargo space is also advantageous. It is claimed that as a commercial machine, the "Wib. 2," would carry a pilot and 13 passengers. Allowing 180 lbs. for each occupant, and about 30 lbs. for the luggage of each, this should be possible, while still carrying wireless outfit and other paraphernalia. In that case, the power expenditure per passenger would be about 46 h.p., which is very reasonable, especially as the speed at 6,500 ft. is stated to be 125 m.p.h.

As regards space in the cabin, we understand that when stripped of its bomb cradles, etc., the cabin space available is 14 ft. 9 ins. long, by 5 ft. 2 ins. wide, by 5 ft. 11 ins. high, or approximately 450 cubic ft.



THE WIBAULT NIGHT BOMBER: General arrangement drawings.

The *fuselage* is also, we understand, built of metal throughout, with the exception of the covering, but as it was not exhibited we have not had an opportunity of examining its constructional details.



One of the best examples of Duralumin construction at the Paris Show: Details of the Wibault wing.

The employment of only a single pair of struts on each side has been made possible by using wing sections of great depth. For the section used, it is claimed that this, which is the result of experiments made by M. Wibault personally, is more efficient than ordinary thin sections, although of the deep, high-lift type. The small amount of external bracing results in a low wing resistance, and the inward slope of the interplane struts in conjunction with the short top plane has the effect of giving equal loading in upper and lower spars, which is not the case where upper and lower bays are equal.

As regards the wing construction, this is indicated in the accompanying sketch. The somewhat unusual view is the result of the fact that the wing from which the sketch was made was standing on its leading edge. The wing spars are built up of Duralumin sheet, flanged over as shown. It will be noticed that the flanges of the lightening holes are produced by simply bending at right angles along straight lines, and that where a radius occurs the flange is made up of a separate piece. This form of construction has the advantage that the flanges can be made without incurring the expense of costly dies for stamping out the flanges. The spar flanges themselves are flat strips of Duralumin riveted to the flanged-over edges of the webs. The number of rivets required is not excessive, and altogether this spar construction is much more of a commercial proposition than the majority of those exhibited. For greater compressive strength, it would probably have been an advantage to have the spar flanges rolled to form a corrugation along their ridge, but even with the flat flanges the spars have withstood a sand load equal, we are informed, to a factor of safety of 7·5, without showing any permanent deflection.

The ribs are entirely tubular, the flanges consisting of tubes, bent to the desired curvature, and the webs formed by a series of N-trusses, attached to the flanges by clips and rivets in the manner shown.

The main characteristics of the "Wib. 2, B.N.2," are as follows: Length o.a., 41 ft. 10 ins; span, 55 ft. 6 ins.; height, 16 ft. 5 ins.; wing area, 1,035 sq. ft.; engine, 600 h.p. Renault; weight empty, but with cooling water, 4,620 lbs.; useful load, 3,100 lbs.; fuel for 4 hours at 6,500 ft.; total loaded weight, 9,450 lbs.; speed at 6,500 ft., 125 m.p.h.; wing loading, 9.13 lbs./sq. ft.; power loading, 15.8 lbs./h.p.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN JANUARY 1 AND JANUARY 7, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying: Mails	No. of flights carrying: Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
						h. m.		
Croydon-Paris	7	9	3	7	7	2 6	Breguet F-ADAV (1h. 50m.)	B. (1), D.H. 4 (1), D.H. 18 (1), H.P. (1), Sp. (1), V. (1).
Paris-Croydon	11	24	3	11	3	4 0	D.H. 18 G-EAWO (3h. 15m.)	B. (1), D.H. 4 (1), D.H. 18 (1), G. (2), H.P. (2), Sp. (2), V. (1).
Totals for week ...	18	33	6	18	10			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Saimson. Se. = S.E.5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

Air Mail Stamp Issues

HITHERTO the stamps issued by the French Government for use in connection with air mail services in certain of their colonies have been "provisionals." Commencing with the new year, however, it is stated that a special set of three stamps—75 c. blue, 1 fr. red and 2 fr. violet—is to be issued for use in French air mail service in Morocco. They will have an appropriate design, showing an aeroplane flying over Casablanca.

Another air mail stamp has just been issued by the Newfoundland Post Office, two previous issues having made their appearance on the occasion of the Hawker and Alcock Transatlantic flights in 1919. This new stamp has been brought into use in connection with the experimental service between St. John's and Halifax, N.S., and consists of the 35 c. Cabot (1897), which has been overprinted "Air Mail to Halifax, N.S., 1921" in three lines. Some 14,000 of these stamps have been issued, and it is said that about 5,000 have been actually used on the service. In connection with the above service it may be of interest to note that the pilot is, we believe, F. S. Cotton, who flew a D.H.14 in the 1920 Aerial Derby.

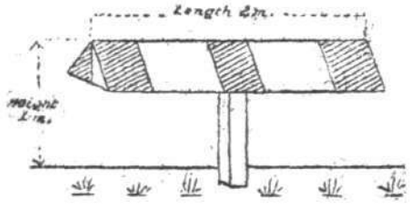
FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

NOTICES TO AIRMEN

France : Civil Landing Grounds, etc.

PREVIOUS Notices to Airmen relating to France are amplified and amended as follows :—

1. *Le Bourget Aerodrome.—Ground Markings.*—A system of ground markings designed to clearly define the bad landing area of the Le Bourget aerodrome in the vicinity of the Morée brook—the north boundary—has been brought into force, as an experimental measure, as from December 12, 1921. These markings are wooden structures, as illustrated in the sketch below, and are placed at intervals of 60 metres. Air-



craft approaching from north should clear the markings before landing, and will then be certain of alighting on suitable ground.

2. *Civil Landing Grounds.*—The following grounds are now available :—(i) *Poix.*—Emergency Landing Gound. *Position.*—Lat. 49°49′N., Long. 1°58′E. Situated 4½ kms. N.N.W. of Poix on the east side of the road to Abbeville. *Dimensions.*—660 by 600 yards (approx.). No further details are at present available. (ii) *St. Quentin.*—Emergency Landing Ground. *Position.*—Lat. 49°50′N., Long. 3°12′E. Situated 7 kms. to the S.W. of St. Quentin. *Dimensions.*—700 to 550 yards, but only the northern half of the ground is at present suitable for use by aircraft. No further details are available at present.

3. *Valenciennes.—Telephone.*—A telephone has been installed at this landing ground. Number—Valenciennes 30.

4. *Previous Notices.*—Para. 2 (1) c of Notice to Airmen No. 36 of 1921 is amplified by para. 3 of this Notice.

(No. 110 of 1921.)

Aerodromes for Civil Use ; Consolidated List

IN new lists (A to D) now ready (No. 1 of 1922), aerodromes, seaplane stations and landing grounds, open to civil aviation in the United Kingdom, and Service and Civil stations, available to civil aircraft in case of emergency only, are shown as corrected to 1st January, 1922.

The lists are classified as before and in alphabetical order.

Notices to Airmen Nos. 81, 96, 104 and 108 of the year 1921 are at the same time cancelled. (No. 1 of 1922.)

Gosport Aerodrome ; Obstructions

THE southern portion of Gosport aerodrome is being used as a sports ground, and goal posts have been erected on the ground.

Pilots having to land on this aerodrome should use the northern portion. (No. 2 of 1922.)

Transmission of Calibrated Waves from Air Ministry Wireless Station

IT is notified that the Air Ministry Wireless Station, London, will, from the 10th of January, 1922, transmit a series of calibrated waves daily at the times shown in notice No. 3 of 1922.

Lympne Aerodrome ; Erection of an Anemometer Mast

PILOTS of aircraft are warned that an anemometer mast is in course of erection at Lympne aerodrome. The mast will be erected in the S.W. corner of the aerodrome near the meteorological office, and will be marked by a black and white danger flag by day and a red obstruction light at night. The top of the mast will be 78 ft. above the ground.

(No. 4 of 1922.)

▣ ▣

"Under the Searchlight"

ONE of the most important books, "Under the Searchlight," by the Hon. Violet Douglas Pennant, to be published shortly, by Messrs. Allen and Unwin, should be of very considerable interest. In this, Miss Pennant proposes to deal with the inner history, from first to last, of what was generally referred to, at the time, as "the great W.R.A.F. scandal." We understand that, with the exception of the mysterious "secret statement," furnished by Miss Philippa Strachey to Lady Rhondda, and by Lady Rhondda to Lord Weir (the nature of which was never divulged, and of which Miss Douglas Pennant, herself, is still entirely ignorant), the book will reveal to the public the fullest details concerning this complex case.

Visual Signals for Aircraft ; Addition

THE following signal is added to the *Standard Table of Visual Signals for use of Aircraft* issued in Notice to Airmen No. 2 of 1920.

Signal.	Ground or sea to aircraft ; signification.	Aircraft to sea or ground ; signification.
A white flare from which, at intervals of about 3 secs., a white light is ejected into the air.	Aircraft on the water in distress and requiring immediate assistance.	Aircraft on the water in distress and requiring immediate assistance.

(No. 5 of 1922.)

NOTICE TO GROUND ENGINEERS

Maintenance of A.V. 8 and A.V. 12 Type Magnetos

THE following precautions should be observed with A.V. 8 and A.V. 12 type magnetos :—

1. *Lubrication.*—Before starting up an engine fitted with a magneto which has been drawn from store or has not been run for some time, care must be taken to ensure that the oil well of the distributor bearing, which is of the plain phosphor-bronze type with wick lubrication, is filled, by passing approximately a teaspoonful of oil down the left-hand hole in the oil cup at the distributor end of the magneto (facing the distributor). Six drops of oil should also be injected into each main bearing through its respective oil cup ; one or two drops to the contact breaker cam lubricating pad, and one to the contact breaker pivot pin. To effect the last, it is only necessary to move the retaining spring to one side.

This provision of oil should nornally be sufficient for twelve hours' running. Thereafter, at similar intervals, twelve drops of oil should be given to the distributor gear wheel bearing, with treatment of the other bearing as stated above.

2. *Contact Breaker.*—The gap between the contact breaker points should be maintained within ·013 in. and ·011 in. A gap of ·012 in. may be regarded as normal.

The contact breaker points, which are slightly convex, should be cleaned, if necessary, with very fine emery cloth, care being taken to ensure that no emery dust is left on the contact breaker. A file should *not* be used for this purpose. A soft brush is convenient for cleaning the contact breaker.

3. *Distributors.*—In changing the magnetos on an engine, it is essential that the original distributor block should be removed, and the new magneto attached complete with its own distributor. The changing of a distributor block from one magneto to another is most undesirable, owing to the possibility of the rotor brush fouling the distributor segments, due to the small gap between these parts and to the working tolerances necessary on distributor, end plate, gear centres, etc.

The setting of the spark gap between the rotor main electrode and the distributor segments must be correctly maintained within the limits of ·010 in. and ·015 in. Normally it should be unnecessary to interfere with this gap, which is correctly set for each individual magneto before its despatch from the maker's works.

The gap between the rotor starting electrode and the distributor segments should be between ·020 in. and ·030 in.

4. *Hand Starter Terminal.*—Care must be taken, when fitting the starter lead to the distributor, that the terminal screw is properly locked by the spring strip provided for the purpose. The screw should be tightened by a box spanner which at the same time will press down the spring clear of the hexagon ; on release, the spring should lock the screw, the latter being turned slightly, if necessary, to ensure this. No part of the screw or the locking spring must project beyond the face of the distributor.

(No. 1 of 1922.)

▣ ▣

The Next Aero Club de France President

FOLLOWING the death of M. Michelin, several names are rumoured to fill the vacant chair of honour. M. Flandin, one-time Secretary of State for Aeronautics, is a first favourite, with several runners-up, but there are those who would like to see M. Bazil Zaharoff take up the work. There is one thing certain ; the more money that attaches to those backing-up official French aviation, the better are the prospects incidentally for the progress of the great science and industry, internationally and otherwise.

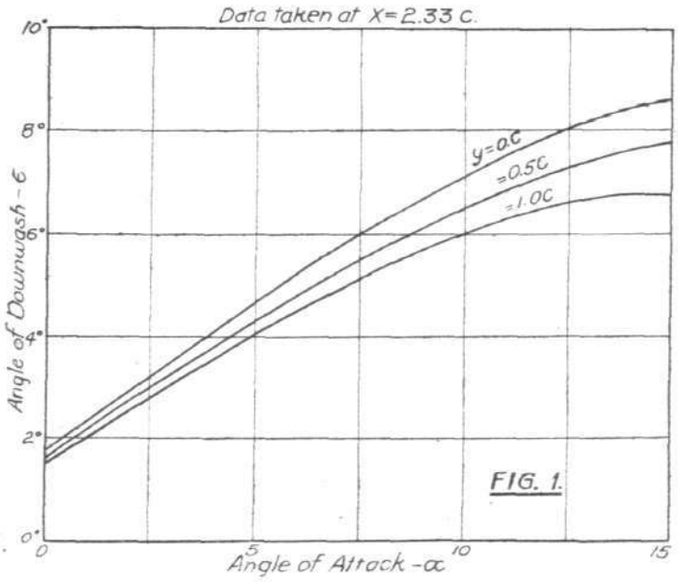
THE DETERMINATION OF DOWNWASH*

By Lieut. WALTER S. DIEHL, Bureau of Construction and Repair, U.S.N.

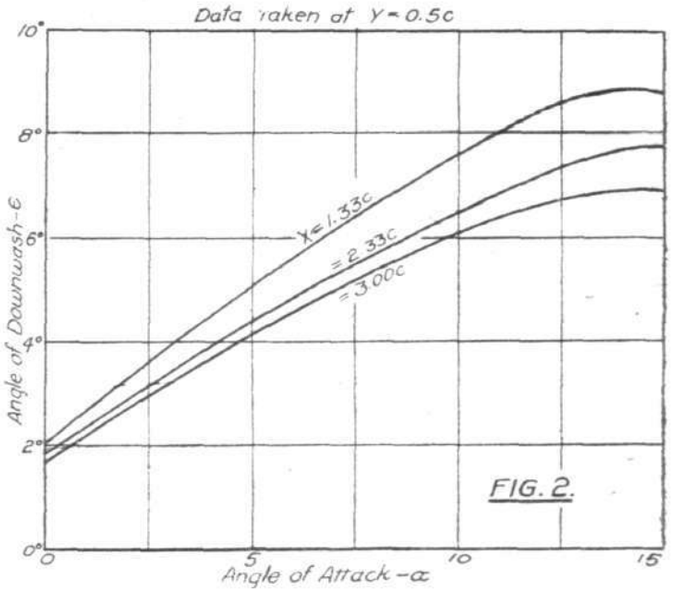
Introduction.—It is obvious that, in accordance with Newton's second law, the lift on an aerofoil must be equal to the vertical momentum communicated per second to the air mass affected. Consequently, a lifting aerofoil in flight is trailed by a wash which has a definite inclination corresponding to the factors producing the lift. It is thought that sufficient data, theoretical and experimental, are now available for a complete determination of this wash with respect to the variation of its angle of inclination to the originating aerofoil and with respect to the law which governs its decay in space.

Munk's Formula for Downwash.—Although it has long been known that the angle of downwash ϵ, as observed at a given point behind the aerofoil, is directly proportional to the lift of the aerofoil (British *A.C.A.*, R. and M. No. 196) and inversely proportional to the aspect ratio (Lanchester, *Aerial Flight*, Vol. 1, Chapter VIII, British *A.C.A.*, R. and M. No. 161). Munk (*Technische Berichte* III-1) seems to have been the first to propose a quantitative solution. He asserts that ϵ must be represented as the product of some constant and the angle of attack as expressed by the formula (Betz, T.B. 1-4),

$$a = \frac{57{\cdot}3}{\pi} \cdot 2\,L_c \left(\frac{S}{b^2}\right)$$



Variation of angle of downwash with depth Y below upper wing. From R. and M., No. 426, Fig. 7.



Variation of angle of downwash with distance X behind wings. From R. and M., No. 426, Fig. 7.

where b is the span, L_c is the lift coefficient and S is the area of the aerofoil. The formula for downwash then becomes

$$\epsilon = c \cdot a = \frac{57{\cdot}3c}{\pi} \cdot 2L_c \left(\frac{S}{b^2}\right)$$

the value of the constant c being determined by experiment. The formula as given applies to monoplanes, but may be applied to multiplanes, according to Munk, by the introduction of another constant k which reduces the span b to the span of the equivalent monoplane.

The values of c were determined for several models by photographing a series of streamers. Owing to the lack of certain vital data, the results have not been included in this study, but the conclusions are given instead. It appears that the equation, as given above, is not general. The values of c vary somewhat more than is allowable for a "constant." No attempt was made to determine the variation of c with aspect ratio, nor was any allowance made for the inevitable dying out of the wash effect in space. It appears, however, that the angle of downwash is substantially constant over about eight-tenths of the span, with sudden changes near the tips.

N.P.L. Formula.—The most comprehensive series of tests on downwash, which have been published, are those by Sandison, Glauert, and Jones (British *A.C.A.*, R. and M. No. 426). In this investigation the variation of downwash was determined in space for a number of points behind, above, and below the trailing edge of the aerofoil. It was found that, in accordance with hydrodynamic theory,† the angle of downwash decreases exponentially with the distance from the aerofoil (a biplane in this case), and might be expressed by the empirical formula

$$\epsilon = \epsilon_0\, 10^{-0.05\,\xi\,-0.08\zeta}$$

where

ξ is the distance behind the wing in chord lengths,

ζ is the distance below the chord of the upper wing in terms of the gap,

and ϵ_0 is a constant for any given arrangement.

This appears to have been the first attempt to express the variation of ϵ_0 from point to point. With a satisfactory law for the variation of ϵ_0 it would have been complete.

Derivation of a Comprehensive Downwash Formula

It is now possible to derive a comprehensive downwash formula based on the Göttingen theoretical and the N.P.L. empirical formulæ. It is known definitely that downwash varies exponentially with distance from the trailing edge. The plotted results of N.P.L. investigations, which show this variation vertically and horizontally, are given in Figs. 1 and 2, respectively. The data in Fig. 1 have been replotted on a logarithmic scale in Fig. 3, with the vertical distance from the trailing edge expressed in chord lengths plus one chord length‡ as abscissa and angles of downwash as ordinates. It is found that for a given angle of attack, the angles of downwash at various vertical distances from the trailing edge lie on a straight line. The lines corresponding to the various angles of attack are all parallel and have a slope of $-13° \pm 0{\cdot}5°$. This indicates that the variation of angle of downwash with vertical distance from the trailing edge can be represented by an equation of the form :

$$\epsilon = c_1\,(y + 1)^n,$$

where c_1 = a constant,

y = the vertical distance, of the point under consideration, in chord lengths, from the trailing edge,

and $n = \tan(-13° \pm 0{\cdot}5°)$

$= -0{\cdot}23 \pm 0{\cdot}01.$

In a similar manner the data from Fig. 2 have been plotted in Fig. 4. The points again fall near parallel straight lines, but their slope, $-21° \pm 0{\cdot}5°$, is steeper than that in Fig. 3. The indicated variation of the angle of downwash with variation of horizontal distance from the trailing edge is of the form

$$\epsilon = c_2 \cdot (x + 1)^n$$

where c_2 = a constant,

x = the horizontal distance, of the point under consideration in chord lengths, from the trailing edge,

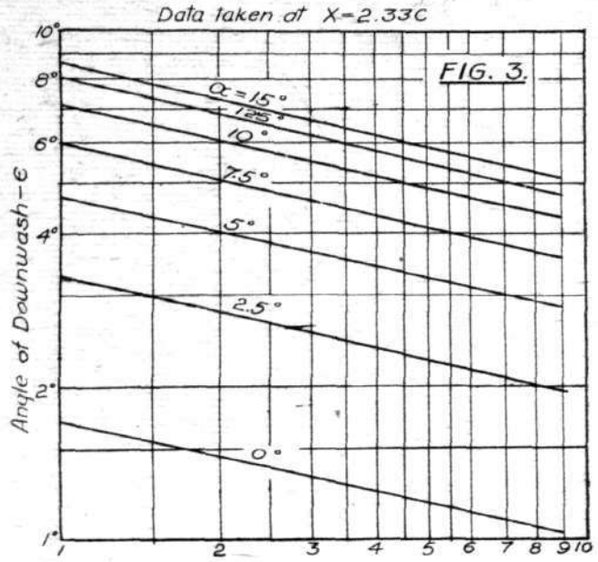
and $n = \tan(-21° \pm 0.5°)$.

$= -0{\cdot}38 \pm 0{\cdot}01.$

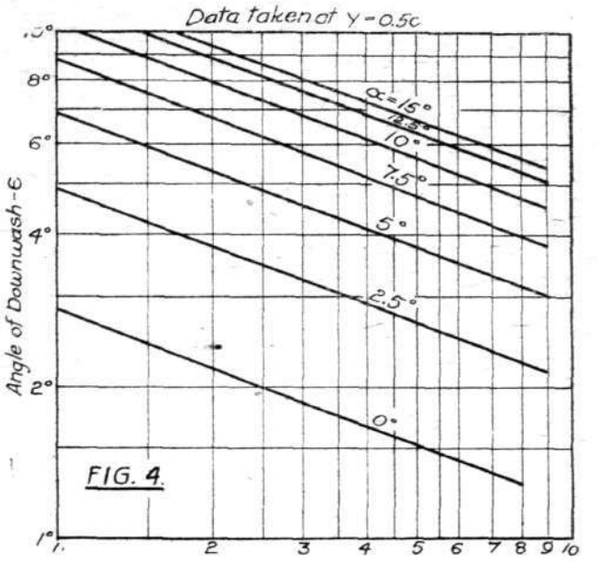
* Technical Note No. 42 of the American National Advisory Committee for Aeronautics.

† See Lanchester, *Aerial Flight*, Vol. 1, Chap. III.

‡ This is necessary so as to provide a finite value at the trailing edge.



Variation of angle of downwash with depth Y below wing. Y = vertical distance from trailing edge in chord lengths (plus one chord length).



Variation of angle of downwash with distance X behind wing. X = horizontal distance from trailing edge in chord lengths (plus one chord length).

TABLE I.—*Determination of K in the Equation*

$$\epsilon = \frac{K}{n} \cdot Fx \cdot Fy \cdot L_c$$

Source of Data	Aspect Ratio (n)	$\frac{\Delta\epsilon}{\Delta L_c}$	x	y	Fx	Fy	$\frac{\Delta\epsilon}{\Delta L_c}\left(\frac{1}{Fx \cdot Fy}\right)$	$K = \frac{\Delta\epsilon}{\Delta L}\left(\frac{1}{Fx \cdot Fy}\right) \cdot n$
N C—1 Curtiss tests	9·5	11·20	2·5	0	·625	1·00	17·9	170
R. & M. No. 196	6	15·20	2·3	0·55	·64	·90	26·4	158
R. & M. No. 426	6	14·70	3·0	0·61	·595	·89	27·8	167
R. & M. No. 426	6	16·00	3·0	0·43	·595	·915	29·3	176
R. & M. No. 515	7·73	11·8	2·6	0·6	·62	·895	21·3	164

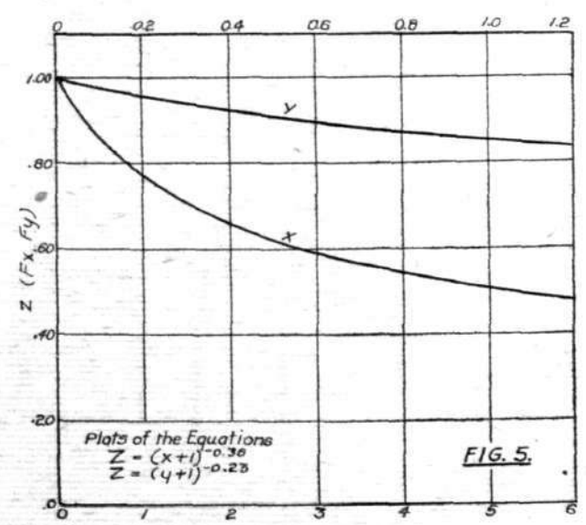
NOTE.—There will be a slight decrease in the value of $\Delta\epsilon/\Delta L_c$ with increase in lift coefficient if the reference point is not fixed in space. This is caused by the change in the co-ordinates of the point with change in angle, and the effect may easily be accounted for.

Let D = distance from trailing edge, T, to reference point P

θ = Inclination to horizontal of line TP

then $x = D \cdot \cos\theta$

$y = D \cdot \sin\theta$



Distance from trailing edge, chord lengths. Y = vertical distance. X = horizontal distance.

In order to eliminate the calculations involving fractional exponents the functions,

$$Z = (y + 1)^{-0.23}$$

and

$$Z = (x + 1)^{-0.38}$$

have been evaluated and plotted in Fig. 5.

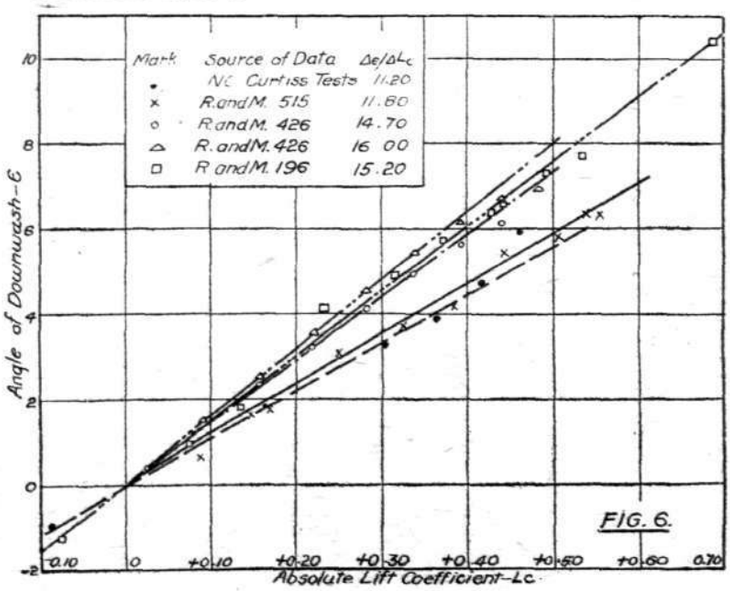
Data from five series of downwash determinations have been plotted in Fig. 6, with angles of downwash as ordinates and lift coefficients as abscissæ. The slope of the straight line, which passes through the points representing a series of tests, determines the value of $\Delta\epsilon/\Delta L_c$ for that particular arrangement and the point in space at which the observations were taken. The aspect ratio, the value of $\Delta\epsilon/\Delta L_c$, and the co-ordinates of the observation point are given, for each series of tests, in Table I.

It is evident from inspection of Fig. 6 that ϵ varies directly with lift coefficient. It has also been shown by data from the tests of Sandison, Glauert, and Jones (British *A.C.A.*, R. and M. No. 426) how ϵ varies in space. Munk's equation indicates that ϵ varies inversely as the aspect ratio, n. Therefore the angle of downwash should be given by

$$\epsilon = \frac{K}{N} \cdot (x + 1)^{-0.38} \cdot (y + 1)^{-0.23} \cdot L_c$$

where K is a constant, numerically equal to $\Delta\epsilon/\Delta L_c$ at the trailing edge of a wing of aspect ratio unity.

The value of K is determined for each of the five series of tests which are plotted in Fig. 6, by substituting the proper values for the functions of x and y and for the aspect ratio n. The procedure is indicated by the headings of columns in Table I.



Variation of the angle of downwash with lift coefficient. Test data.

It is found that K is substantially constant, varying from 164 to 176; a single exception of 158 corresponds to a series of tests on a biplane arrangement, the wings of which were equipped with flaps and represent abnormal conditions. It therefore appears that the angle of downwash can be represented to a good approximation by

$$\epsilon = \frac{170}{n} \cdot (x + 1)^{-0.38} \cdot (y + 1)^{-0.22} L_c$$

$$\epsilon = \frac{170}{n} \cdot Fx \cdot Fy \cdot L_c$$

Fx and Fy being the values of the functions of x and y which are given in Fig. 5.

The validity of this formula is obviously confined to that range of angle of attack or lift coefficient in which the airflow about the aerofoil is not abnormally turbulent.

Application of the Downwash Formula.—The chief use of a downwash formula is the calculation of the aerodynamic angle of attack of the horizontal tail surfaces. For this purpose a reference point is taken on the leading edge of the horizontal tail surfaces and the values of ϵ obtained from the formula. The aerodynamic angle of attack of the tail surfaces will then be

$$\alpha_t = \alpha - \beta - \epsilon$$

where α is the angle of attack of the wing and β is the acute angle between the chord lines of the wings and horizontal tail surfaces, considered positive (in the equation) if the tail is set at a less apparent angle than the wings.

The data from tests seem to indicate that in case of a biplane the maximum angle of downwash occurs in the horizontal plane midway between the two wings. The effect is so slight, however, that the above method may be used, referring the co-ordinates of the reference point to the nearest wing (preferably to the no lift line), with the assurance that the results so obtained will be as precise as it is practicable to calculate them with the data now available.

LONDON TERMINAL AERODROME

Monday Evening, *January* 9, 1922

THE weather has played some curious pranks with the London-Paris aeroplane service during the week. There has been little flying to schedule, and the machines which have completed their journeys have done so with difficulty.

On Tuesday, for instance, when there was a strong northerly wind, a Handley Page "o-400" was five hours on the journey from Paris to Croydon, and, though her tanks had been filled with 240 gals. of fuel before she left Paris, there was only sufficient for about ten minutes' flying left by the time Croydon was reached.

On Wednesday, when the wind was again blowing strongly from the north, a Messageries Aérienne five-seater Spad flew from Poix to Croydon, but had to descend at Lympne for petrol before finishing the journey to Croydon.

There was an amusing scene on the aerodrome on Monday, and one which illustrates the risks of premature publicity, so far as aviation is concerned. A consignment of live pigs was to be dispatched by a special "Goliath" to Paris, and, the fact having been well "advertised" in the daily papers beforehand, the result was that a number of Press photographers, including at least one moving-picture expert, swarmed round the aeroplane, firing off plates and films at top speed. The weather, however, was far from good, and though one of the Instone Air Line "D.H.18's," with Mr. Powell in charge, got away, other firms decided against flying, and the pigs' departure was, therefore, postponed.

The Engines of the "Air Express"

I AM able to give details, which should, I think, prove interesting, as to the running of the 450 h.p. Napier "Lion" motors on the continental air service. One of these engines, which was running in Aircraft Transport and Travel days, in an "Airco" 16, has now put in 407 hours flying. Another "Lion" went for 160 hours without overhaul, and was only dismantled then, owing to regulations and as a matter of policy. The engine at present in the "D.H.18 G-EARO" has been running for over 130 hours since its last overhaul, and seems good for another 130 hours. Actual fuel measurements, taken over long periods of commercial work, show that the consumption of petrol with the "Lion" is 24 gals. an hour, while the amount of oil used is about 7 pints an hour.

Mr. Butler, who is the private owner of a Bristol "tourer," was down at the aerodrome on Sunday, and gave a few friends joy-rides in his machine. He afterwards flew over to Stag Lane aerodrome, and left the Bristol there. It is understood that he intends to purchase a "D.H.9." He is shortly leaving for Newfoundland, and will take the "9" with him, but details as to what he intends to do with the machine there are, at the moment, lacking.

The Surrey Flying Services have now almost completed the Avro for the Marconi Co. It has been altered to take a Renault engine, and has been allotted the registration number "G-EBAJ"—which, incidentally, is worthy of note, showing as it does that civil aircraft now registered have, apparently, run through the combinations of the last two letters, and have started on the last three.

Another Avro is being built-up for a private owner, and Mr. Grant is having quite a busy time.

Captain Muir is at present in Liverpool, where he is testing a Parnall "Puffin" for the Disposal Co. Demonstrations of this machine are to be given in the presence of representatives of various foreign Governments, and are to include all the "stunts" a deck-amphibian is capable of.

Mr. Leysmith was at the aerodrome during the week, collecting a few odds-and-ends he required for the search-lights and other lighting equipment at Lympne. Judging by the time he has been away from Croydon, the lighting arrangements at Lympne must be on a very comprehensive scale.

The lighthouse at Croydon has not, as yet, been moved to Titsey Hill. Apparently the erection of the tower there to accommodate it is occupying rather more time than was anticipated at first.

Telephoning to Machines in Flight

AN "extension" from the wireless cabin has now been carried to the control-tower, and the wireless operators can, when required, "plug" the control-tower through to any aeroplane in flight. This arrangement has been adopted in connection with the "sectionalising" of the aerodrome for an improved method of direction-finding when an aeroplane is near the 'drome, but is unable to see it in mist or fog. Each pilot will have a map, showing the sections of the aerodrome, and the man in the control-tower will be able to tell him which section he is over, without any such short-time lag as may be reckoned with in the normal direction-finding method.

A small army of painters have invaded the aerodrome, and are busy on the Instone offices. The new Instone goods-office is approaching completion. It is interesting to note that the recent reductions in freight rates, announced by Instones', have been followed by other firms, who have brought their charges into line.

Aerial Advertising

OUR Editorial remarks on this subject in last week's issue called forth a visit from the inventor of this new form of smoke signs. While he does not yet wish to have details of his invention published, he placed at our disposal sufficient material to enable us to form the opinion that, not only are the prospects of a general application of the invention far less annoying than appeared at first sight, but that actually, apart from any question of aerial advertising, the invention has its numerous scientific uses, some of which are undoubtedly of very great value indeed. Without going into details, it may be intimated that the invention will probably enable experiments to be made on full scale machines on problems connected with such complicated subjects as the accurate determination of downwash and of the air velocity at various points in the neighbourhood of the *fuselage*, wings and tail of an aeroplane. Even the smoke signs themselves, we are given to understand, so far from being a blot on nature, are most fascinating things to watch, although the advertisement side is merely an incidental. We are awaiting a demonstration at an early date.

A Fairey Weight-Lifter.

HITHERTO it has been the fashion, at any rate where seaplanes are concerned, to employ twin-engined machines when great loads had to be carried. This precedent now appears to have been destroyed by a Fairey single-engined seaplane, which has carried a useful load of 3,100 lbs. The machine is a tractor seaplane, with Rolls-Royce "Eagle" engine, and as the total weight lifted was 7,250 lbs., the power loading was about 20 lbs./h.p. Incidentally this performance probably constitutes a record for weight lifted by a single-engined machine of this power.

FLIGHT

SPECIALISED AIRCRAFT

THIS was the title of a Paper read by Wing-Commander W. D. Beatty, C.B.E., A.F.C., before the Royal Aeronautical Society on January 5, 1922. It proved to be a very interesting paper indeed, although scarcely in the way one would have expected from its title. The first part of the paper was mainly historical, and gave a review of the development of military machines from the time of the Military Trials on Salisbury Plain in 1912 up to the end of the War. The lecturer gave in table form particulars of the devlopment of specialised types, under the headings of Training Machines. Fighters, Reconnaissance and Day-Bombing Machines, Night Bombers Ship Aeroplanes, Torpedo Aeroplanes,, Seaplanes, and Flying Boats. On the subject of commercial aircraft, the lecturer mentioned that the first organised services were operated with machines of war type, variously modified to meet civil requirements, and that the need of special designs soon made itself felt. In his opinion, Commander Beatty said, we were now at a stage, as regards commercial design, about equivalent to that of military design at that period of the War when slow two-seaters armed with a rifle or a stripped Lewis gun carried on the general air work of the Army. The real commercial aeroplane has not yet, he said, been developed. Progress has, however, been made in the right direction, as shown by a table of early types of commercial aeroplanes showing the development in useful load and performance, from the Avro with 60 h.p. Green engine (the machine on which the late Lieut. Parke did his famous "dive" at Salisbury Plain) through the Vickers-Vimy Commercial, Handley Page W. 8, and D.H. 18, to modern times.

In order to arrive at the user's view of his machines, the lecturer studied them from the point of view of the profit and loss account of the operating firm. In order to reduce expenditure the following qualities are required: Low first cost, economical maintenance, and economical running. By careful design, the lecturer said, manufacture can be simplified and expensive fittings eliminated. Moving parts and friction between them should be reduced to a minimum. Parts which require attention should be easily accessible, and engines must be readily removable. In regard to the latter Commander Beatty said he would very much like to see comparative tests carried out on engines removable complete by themselves and removable complete with their mounting. The latter method, he stated, is probably the quicker in operation, but will have to bear the charges due to the additional capital outlay on spare mountings. The engine should be capable of running for 300 to 500 hours without overhaul. At present he thought we were getting close to a standard period of 100 hours between overhauls.

Turning to the receipts side of the account Commander Beatty pointed out that one must have a large load-carrying capacity, but that this is of no avail if the traffic sufficient to fill it cannot be attracted. He then proceeded to deal with the requirements from the point of view of the passengers, and as this part of the paper was extremely interesting we publish it practically verbatim—with only a paragraph deleted here and there where it has been possible to do so without detracting greatly from the value of the paper:—

"*Passengers' Needs.*—Far more attention is necessary to the comfort of passengers, and this embraces a wide variety of detail. I cannot but think that considerable advance might be made in forthcoming commercial types were designers to travel to and from Paris in each of the various types of aircraft actually in use on the cross-Channel services. This is the slack time of the year for passenger traffic; why should not the transport companies grant a certain number of free return tickets to *bona fide* designers, thus affording them opportunities to ascertain in their own vile bodies the various existing causes of discomfort and learn what to avoid? Passengers are the most important source of revenue for air transport firms at the present time, and each that considers that he has had a really comfortable journey is a walking advertisement for the air line, while each dissatisfied passenger will result in a lowering of possible receipts.

"*Silence.*—First and foremost amongst the important items affecting comfort I would place silence. A "desirable attribute" in 1912, it has never yet been attained in normal practice, and the air line passenger still suffers acute discomfort from the noise to which he is subjected.

"It is true that the noise in a machine comes from a variety of sources, but it is urgent that some at least should be eliminated. Promising exhaust silencers have appeared experimentally; it is for designers to incorporate them in their designs. Never should an open exhaust point in the direction of the cabin. Get rid of the barking roar of the exhaust, and it becomes possible to identify and so to eliminate the other noises. Probably modifications in the design of propellers may be desirable, and with a silent exhaust it becomes an easier matter to compare the noise effect of two different propellers. Fabric covered *fusel ges* must also, I think, be relegated to the past; a stiff wooden covering does not transmit to the interior of the cabin the blows from the slipstream in the same way that fabric does. Vibration and resonance are closely allied to noise in effect on passengers, and should be eliminated. It may be necessary on these grounds to ensure that the two engines of a twin-engined machine never synchronise. I believe Colonel Bristow is trying experiments on these lines. Engine designers will need to utilise motor-car experience, and get rid of that variety of noises from gears and other moving parts which at present are so obvious in an aero-engine when its exhaust does happen to be silenced."

Ventilation and Heating.—"The next important detail which designers should carefully study is that of ventilation, to which very little attention has hitherto been given. Adequate ventilation of the cabins of commercial aircraft is a problem that presents considerable difficulty. The cubic space available is very limited, so that the air inside the cabin tends to become vitiated rapidly, while the speed of the machine is such that the velocity of in-coming air is often so high that the passenger feels a draught. In rough weather, therefore, the unfortunate passenger tends to suffer from depression, headache, cold and illness."

"For many years the efficiency of ventilation has been determined by the quantity of carbon dioxide present in the atmosphere. The supply of air generally recognised as necessary to remove all sensible impurities amounts to 3,000 cubic ft. per hour per person. In a present-day cabin of 300 cubic ft.—seating ten passengers—the air must be changed 100 times an hour if the standard allowance is to be provided. In practice, such a rate of change is unobtainable, except in unbearably draughty conditions. It is clear then that the measurement of the CO_2 content is likely to continue to be unsatisfactory."

"Professor Leonard Hill, however, has pointed out that the 3,000 cubic ft. figure can be much reduced if the cooling, drying and radiant energy conditions are satisfactory. To afford a means of determining these conditions he invented the 'Kata' thermometer. Experiments have shown that the information given by this instrument is an accurate guide to the adequacy of the ventilation so tested, and if its readings average between six and eight the conditions may be considered satisfactory. Now the cooling and drying effects of air depend largely upon its rate of movement, and it may be taken that if the temperature of the air is 55° to 60°, its velocity at the inlet to the cabin should not exceed 4½ ft. per second, if the inlet is 18 ins. or more from the passenger, or 3 ft. per second if it is less than 18 ins. from the passenger."

"With inadequate warming arrangements, a change of air more frequently then three to five times an hour is likely to be uncomfortable in the normal cabin, and under such conditions it may be found necessary to keep the velocity of in-coming air down to 1½ to 2 ft. per second. The velocity of out-going air may be as much as 10 ft. per sec. at the orifice, particularly if that is at least 18 ins. from the passenger. Designers should, I think, aim at providing for some twenty changes per hour, taking care to avoid draughts and make satisfactory heating arrangements. If it is found that the air is being changed too rapidly for comfort, it is a very simple matter to close up some of the openings. It is far more difficult for the user of the aircraft so to alter it as to increase the regular supply of air if the original arrangements have proved inadequate."

"Now, how is the air to be changed? Experiments in America on sleeping cars showed that, provided the foul air was expelled, an ample supply of fresh air found its way through cracks and crevices in a swiftly moving vehicle. Personally, I think it better to arrange for the removal of the foul air than to trust to luck to its finding its way out. It should be practicable to design suitable aspirators to draw the air from the cabin of an aeroplane—slightly above the floor level, for, though hot air rises, vitiated air tends to descend. It is probable that air entering through cracks and crevices will do so at such a velocity as to be a source of discomfort to passengers, particularly as its temperature is likely to be low. Air inlets should, therefore, be arranged

at the front of the cabin, somewhat below the roof; the velocity of air entering here can readily be governed by the insertion of right angle bends in the trunks leading to the inlets: each such right angle bend reducing the total flow by 50 per cent."

"It must be remembered that it is essential that the incoming air should be free from impurities, due to exhaust gases, petrol fumes, stale oil, and so on. Special arrangements for the aspiration of the air from the engine compartment—which should in any case be bulkheaded off from the passenger cabin—may be of value in preventing leaks of impure air into the cabin.

"Heating is closely bound up with ventilation, and at the temperature likely to be met with in ordinary flying, it is essential that arrangements should be made for warming the cabin. It is possible to arrange for a supply of air heated by the exhaust pipes, but it should be remembered that air that has been in contact with metal heated to some 200° C., is definitely unsuitable for breathing. If a muff on the exhaust is used, it should therefore be stepped up, the in-coming air for the cabin being taken from the outer step."

"Some of you, however, may remember the footwarmers which Cody fitted to his machine, heated from a bye-pass off the engine cooling system. While there are objections to the introduction of such complications in a matter so important as the running of the engine, no serious difficulty should be experienced in fitting a hot water or steam heating system which draws its heat from the exhaust. Such a system, once developed experimentally, should prove very satisfactory and require little or no attention, while its weight ought not to be excessive."

"A suitable arrangement for ventilation and heating might be as follows:—At the forward end of the cabin fresh air enters at a rate of 3 ft. per sec., through an inlet about 12 ins. by 12 ins. in size, slightly below the roof. Aspirators, arranged below the seat level at the back of the cabin, suck out the vitiated air. An exhaust heated tubular boiler supplies steam or hot water to a radiator fitted two or three inches in front of the fresh air inlet, and the same heating system includes footwarmers in the cabin floor. Such an arrangement should imply fresh air, warmth and comfort for the passengers. I am indebted to Colonel Heald for much of the information upon which the foregoing is based."

"The form of construction of the cabin directly affects its warmth, and from this point of view the fabric-covered cabin is very bad. With this material radiation to the outer air is so rapid that adequate warming in cold weather is almost out of the question."

Seats.—"However, I must return to the subject of passengers' comfort, and I wish to say a word or two about seating accommodation. It always seems to me that chair designers work entirely by tradition, and that if any scientific study of the subject has been made, no attention has been given to the conclusions reached. If the tyres on the wheels of a motor-car are too small, the vehicle is uncomfortable to ride in, and the tyres wear out rapidly. Similarly, if the weight of one's body is carried by a small portion of it, that part quickly gets fatigued and the whole body feels uncomfortable. Only too often seats are designed so that an unnecessarily small portion of one's anatomy bears the majority of the weight. Why should not designers study the problem carefully in conjunction with anatomists and produce a light chair properly designed to suit the human form and to keep the loading per sq. in. of flesh at a low figure."

Number of Engines.—"There is room for much diversity of opinion in regard to single engine *versus* twin engine, or multi-engine machines. While traffic is small the lower first cost and running cost of a single engine machine has an important bearing on the matter. If a twin engine machine will carry nearly double the load of a single engine machine, it immediately becomes a serious competitor economically if the available traffic is sufficient to fill it. Here arises the problem of how large can a *fuselage* be built practically for a single engine machine. In military aircraft great weight can be carried in a small compass, as the load is in a very condensed form. But in commercial types there will be a continual demand for more cubic space per passenger. Will *fuselages* be necessarily so large that high-powered engines will be economically unsound? In the De H.18, eight passengers are carried at 56 h.p. each; in the De H.32, eight at 45 h.p. each."

"Let us assume that we are considering the use in a single engine passenger aircraft of a 1,000 h.p. engine. For that power we must accommodate at least 22 passengers, and we should endeavour to allow at least 40 cubic ft. of space per head. Is such a *fuselage* practicable for a single-engined machine? What is the limiting size? How is propeller efficiency likely to be affected? These questions, which also concern the practicable size of twin-engine aircraft, are matters on which I feel sure that engine designers would like the considered views of aircraft designers, otherwise they may be devoting their attention to engines of a size likely to be unsuitable for commercial work."

"The twin-engined machine has some advantages over the single-engined, particularly if it will fly on one engine. Greater reliability is thereby secured, and to the psychological desire of many passengers for a machine with more than one engine is added the greater favour with which insurance companies may regard it."

Salvage.—"From the insurance point of view, emergency exits for passengers should be provided, and the question of salvage is of some importance. Attention to details which facilitate quick repairs in the event of trouble, and easy transport of spare parts, may assist a constructor in obtaining the favour of those august underwriters whose opinions are reflected with much emphasis in the balance sheet of the transport firm."

The Discussion

THE discussion which folllwed the reading of the paper was opened by Sir Samuel Instone, Director of the well-known Instone Air Line, who stated that he was not a technical man, and had never claimed to be one, representing the commercial side solely. He stated that he would like to emphasise how essential it is that the Government should help financially. Commerce, he said, has been bled white by taxation, and it was no good expecting financiers in the City to find the means for commercial air development. In the old days, there was plenty of money in the City, and financiers were able to find the money for the development of the Mercantile Marine. As things are at present, this could not be repeated on behalf of Civil Aviation, and the Government simply *must* assist. The percentage set aside for subsidies was totally inadequate—£200,000, out of a total vote of £16,000,000. And even that small percentage, he stated, appeared to be grudged. To him it seemed that the spirit at the Air Ministry was not how best to spend that £200,000, but "How much can we save out of the £200,000?" Sir Samuel expressed satisfaction at hearing the lecturer say that there was an advantage in two-engined machines, as his firm had always found that the public were more confident in a twin-engined than in a single-engined machine. As regards the question of giving free return tickets to designers, as suggested by the lecturer, his firm had always done so on demand, and would always be pleased to do so whenever possible.

Mr. F. Handley Page said that, in his opinion, commercial aircraft would become more and more specialised as time went on, and he thought that the development would be towards the smallest possible head resistance, so as to waste no single horse-power that could be saved. Once in the air, one would throttle down, and thus spare the engine as much as possible. The question of the passengers' comfort was a very important one, and especially that of ventilation. With reference to the suggestion of giving free tickets to designers, Mr. Handley Page caused much amusement by saying, jokingly, that perhaps his machines had not so many seats to spare as those of Sir Samuel, but that nevertheless he would promise to do what he could. He was pleased to hear twin-engined machines spoken so well of, the more so as a distinguished member of the Royal Aero Club had, that very afternoon, slated him for saddling commercial aviation with some of the most damnable creations in the way of out-of-date twin-engined machines. He was glad to hear other people confirm the faith of the public in twin-engined 'buses.

Major C. C. Turner disagreed with the lecturer in considering Great Britain too small for air lines, mentioning several distances which exceeded that of the London-Paris services. He thought that the public faith in twin-engined machines was largely caused by lack of information, and did not think that a well-designed single-engined machine was any less safe than a twin-engined one.

Major Kennedy was somewhat disappointed with the small attention given in the paper to specialised aircraft. From the title of the paper, he had expected to hear something about special types for mails, parcels, etc., as well as about passenger machines. He also would like to emphasise the necessity for strong Government support.

In his reply, Commander Beatty said he agreed that he had said nothing about specialised machines for mails and parcels, chiefly (amid merriment), he said, because he regarded the present machines as mail and parcels machines, and not really fit for passenger carrying.

Finally, Sir Samuel Instone stated that it might interest those present to hear that his firm had ordered three machines specially designed for carrying goods and parcels.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

THE ROYAL AIR FORCE

London Gazette, January 3, 1922

Memoranda

Lieut.-Col. (actg. Col.) I. Curtis, M.A., A.M.I.M.E., relinquishes his temp. commn. and retains rank of Col.; Oct. 1, 1920 (substituted for *Gazette*, Dec. 7, 1920). Lieut. R. C. Macpherson (Lieut., Black W.) relinquishes his temp. R.A.F. commn. on return to Army duty; March 28, 1919.

The follg. are deprived of permission to retain their ranks on conviction by the Civil Power.—Sec. Lieut. H. La Touche Templeton; Nov. 8, 1921. Lieut. W. A. C. Dicketts; Oct. 18, 1921.

Two cadets are granted hon. commns. as Sec. Lieuts., with effect from dates of their demobilisation.

London Gazette, January 6, 1922

General Duties Branch

G. A. F. Bucknall is granted a perm. commn. as a Pilot Offr., with effect from Dec. 30, 1921, and with seny. Dec. 30, 1920. Pilot Offr. on probn. H. J. Toye is confirmed in rank; Nov. 9, 1921.

Memorandum

Hon. Sec. Lieut. F. J. Gichard relinquishes his hon. commn. on appt. to T.F. Dec. 22, 1921.

ROYAL AIR FORCE INTELLIGENCE

IT is notified that Air-Commodore F. C. Halahan, C.M.G., D.S.O., M.W.O., assumed duty as Director of Aeronautical Inspection on January 3, 1922. This post was formerly held by Brig.-Gen. R. K. Bagnall-Wild, C.M.G., C.B.E., who recently succeeded Air-Commodore H. R. M. Brooke-Popham, C.B., C.M.G., D.S.O., A.F.C., as Director of Research on the appointment of the latter as Commandant of the Royal Air Force Staff College, on formation.

The following other appointments in the Royal Air Force are notified:—

Wing-Commanders C. E. C. Stanford, D.S.O., M.B., B.Sc., from Headquarters, Inland Area, to Inspectorate of Recruiting (Coastal Area) as Medical Inspector of Recruiting. 19.12.21. M. G. Christie, C.M.G., D.S.O., M.C., from Air Ministry (Controller-General of Civil Aviation) to R.A.F. Depôt (Inland Area). (Supernumerary.) 1.1.22. A. V. Bettington, C.M.G., from Headquarters No. 11 (Irish) Wing to School of Military Administration. Attached for Senior Officers' Course of Instruction. 13.1.22. H. R. Nicholl, O.B.E., from Headquarters, Inland Area, to School of Military Administration. Attached for Senior Officers' Course of Instruction. 13.1.22. H. S. Turner, M.B.E., D.T.M., from Headquarters, No. 1 School of Technical Training (Boys) (Halton) to School of Military Administration. Attached for Senior Officers' Course of Instruction. 13.1.22.

Squadron-Leaders W. R. Read, M.C., D.F.C., A.F.C., from No. 216 Squadron (Middle East Area) to R.A.F. Depôt (Inland Area). 28.11.21. N. C. Spratt from School of Naval Co-operation and Aerial Navigation (Coastal Area) to Air Ministry (Directorate of Research). 12.1.22. A. E. Gaskell, D.S.C., from Headquarters, Coastal Area, to No. 29 Group Headquarters (Coastal Area). 25.1.22.

Squadron Leaders E. W. Craig, M.C., M.B., from No. 2 Flying Training School (Inland Area) to R.A.F. Depôt (Inland Area). (Supernumerary.) Attached for temporary duty to Air Ministry (Directorate of Medical Services). 9.1.22. G. S. Marshall, O.B.E., from Research Laboratory and Medical Officers School of Instruction (Inland Area) to R.A.F. Depôt (Inland Area). (Supernumerary.) Whilst on Study Leave. 2.1.22. G. H. Bowman, D.S.O., M.C., D.F.C., from School of Naval Co-operation and Aerial Navigation (Coastal Area) to R.A.F. Depôt (Inland Area). (Supernumerary.) Attached to Central Flying School (Inland Area) for Flying Refresher Course, pending embarkation overseas. 16.1.22. G. W. Robarts, M.C., from Air Ministry (Director-General of Supply and Research) to R.A.F. Depôt (Inland Area), (Supernumerary.) 12.1.22. To join 31.1.22. C. H. Elliott-Smith, A.F.C., from R.A.F. Depôt (Inland Area) to Headquarters (Inland Area). 13.1.22. W. B. Hargrave, O.B.E., from Central Flying School (Inland Area) to Headquarters, R.A.F., India. 31.12.21.

Flight-Lieutenants J. K. Summers, M.C., from No. 2 Flying Training School (Inland Area) to No. 5 Flying Training School (Inland Area). 18.1.22. A. Lees, from R.A.F. Depôt (Inland Area) to Aeroplane Experimental Establishment (Inland Area). 9.1.22. G. E. Godsave, from Air Pilotage School (Cadro) (Inland Area) to Admiralty Compass Observatory. 23.1.22. J. W. Woodhouse, D.S.O., M.C., from Inter-Allied Aeronautical Commission of Control (Hungary) to R.A.F. Depôt (Inland Area). (Supernumerary.) 20.12.21. C. H. Keith, from School of Naval Co-operation and Aerial Navigation (Coastal Area) to No. 230 Squadron (Costal Area). 2.1.22. I. T. Lloyd, from School of Naval Co-operation and Aerial Navigation (Coastal Area) to No. 2 Flying Training School (Inland Area). 2.1.22. H. E. P. Wigglesworth, D.S.C., from Air Ministry (Directorate of Equipment) to R.A.F. Depôt (Inland Area). (Supernumerary). 19.1.22. B. C. Adamson, from Inland Area Aircraft Depôt (Inland Area) to R.A.F. Cadet College (Flying Wing) (Cranwell). 9.1.22. J. W. Harper, M.D., to Research Laboratory and Medical Officers' School of Instruction (Inland Area). On appointment to short service commission. 14.12.21. O. Armer, to R.A.F. Depôt (Inland Area), on attachment to Royal Air Force from Army Dental Corps. 30.11.21. To Electrical and Wireless School (Inland Area). 17.12.21. J. V. Read M.B.E. The recent notification wherein this officer was posted from Inland Area Aircraft Depôt to R.A.F. Cadet College (Flying Wing) is hereby cancelled.

Flight Lieutenants A. W. Fletcher, D.F.C., A.F.C., from R.A.F. Base, Leuchars (No. 3 Squadron) (Coastal Area), attached to H.M.S. "Argus" for flying duties. 7.1.22. L. C. Keeble, from R.A.F. Base, Leuchars (205 Squadron) (Coastal Area). Attached to H.M.S. "Argus," for flying duties. 7.1.22. H. V. German, from R.A.F. Base, Leuchars (Coastal Area) to half-pay list. 27.12.21. E. A. Fawcus, from No. 6 Squadron (Middle East Area) to R.A.F. Depôt (Inland Area). (Supernumerary.) 4.11.21. H. O. Long, D.S.O., from R.A.F. Depôt (Inland Area) to Instrument Design Establishment (Inland Area). 5.1.22. C. W. Wilson, from R.A.F. Depôt (Inland Area) to No. 1 Stores Depôt. 12.1.22. F. G. M. Williams, from British Naval Mission (Greece) to R.A.F. Depôt (Inland Area). (Supernumerary.) 31.12.21. To join 28.1.22. L. H. Slatter, O.B.E., D.S.C., D.F.C., from No. 203 Squadron (Coastal Area) to half-pay list. 11.1.22. P. J. Wiseman, from Air Pilotage School (Cadre) (I land Area) to Central Pay Office (Inlnd Area). 1.1.22. O. W. de Putron, from Experimental Section, Royal Aircratf Establishment (Inland Area) to School of Army Co-operation (Inland Area) 18.1.22. W. J. King, D.C.M., from Headquarters, R.A.F., Cranwell to No. 1 Stores Depôt. 23.1.22. E. S. Baker, from No. 1 Stores Depôt to No. 4 Stores Depôt. 17.1.22. T. Bell, M.M., from No. 3 Stores Depôt to the Packing Depôt. 17.1.22. H. S. Scroggs, from No. 4 Flying Training School (Middle East Area) to No. 45 Squadron (Middle East Area). 6.12.21. N. H. Bottomley, A.F.C., from Egyptian Group Headquarters (Inland Area) to Headquarters (Middle East Area). 7.11.21. E. M. Cashmore, from Stores Depôt, Egypt (Middle East Area) to Headquarters (Middle East Area). 1.12.21. F. T. Allen, from R.A.F. Depôt (Inland Area) to No. 2 Flying Training School (Inland Area). 4.1.22.

THE ROYAL AIR FORCE MEMORIAL FUND

A MEETING of the Executive Committee of the above Fund was held at No. 7, Iddesleigh House, Caxton Street, S.W. 1, at 3 p.m., on Wednesday, January 4, 1922. The following members of the Committee were present:—Lord Hugh Cecil (Chairman), Dame Helen Gwynne-Vaughan, Mrs. Barrington-Kennett, Air Vice-Marshal A. V. Vyvyan, Messrs. F. E. Rosher and H. E. Perrin.

Letters of regret for non-attendance were received from. Lady Leighton, Major-General Sir Sefton Brancker, and Mr Walter Field.

The usual financial statements and the list of grants made since the last meeting, held on December 7, 1921, were submitted and approved. The amount of Grants made was £303 13*s.* 8*d.*, which is a considerable reduction on the average amount of the previous few months. The chief matter on the Agenda was the R.A.F. War Memorial, and much progress was made in this matter, and it was resolved that matters of subordinate importance in connection with the Memorial should be left to the decision of the War Memorial Sub-Committee, and it is hoped that within a very short time the actual execution of the Memorial on the Thames Embankment will be commenced.

The Secretary was instructed to prepare the Annual Report for 1921, on the lines of the one issued for 1920, and it is hoped to have this Report issued by the end of February.

The next meeting of the Committee was fixed for Wednesday, February 15, 1922, at 3 o'clock.

Royal Air Force Sports Board.

THE following fixtures have been arranged for January:—January 7, Rugby (R.A.F. *v.* Northampton, at Northampton); 11, Rugby (R.A.F. *v.* Guy's Hospital, at Honor Oak); 11, Fencing (R.A.F. *v.* Bertrand's Academy, at Hanover Square); 19, Rugby (R.A.F. *v.* Blackheath, at Blackheath); 21 to 28, Association (R.A.F. Memorial Fund Football Week, at Blackheath); 28, Rugby (R.A.F. *v.* Llanelly, at Llanelly).

R.A.F. (Cadet) College

THE following is a list of Cadets, in order of merit, who passed out of the Royal Air Force (Cadet) College in the December examinations:—Mills, G. H. (awarded Fellowes Memorial Prize), Barratt, J. B., Waite, R. N., Akerman, W. J. M., Revington, A. P., Hayter-Hames, N. C. (awarded R. M. Groves Memorial Prize), Mackay, M. B., Whelan, R. D., Shepherd, G. C. (subject to completion of flying training), Mangles, R. A. R., Brown, J. R., Spaight, R. H. S. (subject to completion of flying training), Bernard-Smith, G. C. B., Rowe, F. C. T., Bonham Carter, D. P. F., Mitchell, F. G. S., Brook, W. A. D., Gore, C. W., Stone, R. A. B., Falconer, C. L. (awarded Sword of Honour), Coombe, G., Desmond, D. J., Gay, G. W., Lacey, E. V. S., Springfield, C. M. O. C., Stone, C. J., Pontifex, R. W., German Williams, M. H., Hawtrey, J. G.

The Art of "Press Cutting" Agencies

LIKE most newspapers, FLIGHT, under arrangements, receives newspaper references to matters that specially concern us—to wit, aviatic. At times we are favoured with some weird and wonderful selections accordingly, but the Christmas festivities account for one cutting which brought us up with a jerk: "A night of Flying Chimney-pots." And then there are folk who maintain aviation has made no progress.

Washington and Aircraft

As was expected from the first, the Washington Conference has realised the difficulties of any attempt to limit the construction of aircraft and at the same time avoid handicapping the development of aviation for commercial purposes.

On January 9, the representatives of the Five Powers accordingly arrived at the conclusion that it is impossible at present to limit the development or the use of aircraft, and adopted a resolution recommending the creation of an international Commission to study the question with a view to future limitation.

This is in harmony with the report of the Sub-Committee upon the subject, which was of the opinion that it is impossible to limit the size and use or characteristics of aircraft other than lighter-than-air machines, and that the question of restricting aircraft in war should be left open for a future conference.

French 1922 Air Budget Details

LAST week, details of the French Air Budget for 1922 were available, and total, as passed by Parliament, to just under 436 million francs. The main appropriations are: *Minister of War:* For Home Squadrons, 214,287,500 francs; Algeria and Tunis, 9,936,490 francs; Morocco, 22,173,092 francs. Total, 246,397,082 francs. *Under Secretary of State Department for Aeronautics:* 147,219,970 francs, which includes foreign air attachés, 200,000 francs; technical service, 5,400,000 francs; prizes and subsidies for commercial aviation, 45,382,000 francs.

Ministry of Marine: 37,318,543 francs.
Ministry of Colonies: 4,991,000 francs.

Air Traffic at Bourget, the Paris Air Port

OF considerable interest and importance are the figures now available for the past year's growth of flights and passengers and freights carried. For the month of December, the figures are: 148 flights (arrivals and departures), 359 passengers, 7,277 kilogs. of freightage, and 84 kilogs. of mails. For the full 12 months to December 31, 1921, last (compared with 1920) the figures are: Flights, 4,022 (3,359 in 1920); passengers, 13,369 (6,850 in 1920); goods, 150,309 kilogs. (120,745 in 1920); mails, 3,308 (1,474 in 1920).

These figures are for the airways in operation between Paris and London, Paris-Brussells-Amsterdam, Paris-Strasbourg-Prague-Warsaw, Paris-Amsterdam and Paris-Havre.

Rumpler's Figures in Germany for 1921

OVER the Berlin-Augsburg air-route, which the Rumpler Co. have been exploiting, the totals for 1921 are given as 1,244 passengers and 3,286 kilogs. of mails carried.

The Use of Light as an Aid to Aerial Navigation

A DISCUSSION upon the above important subject will be opened by Lieut.-Col. L. F. Blandy, D.S.O., at the Royal Society of Arts, at 8 p.m., on January 31, under the auspices of the Illuminating Engineering Society. At this joint meeting with the Royal Aeronautical Society, Major-General Sir Frederick Sykes will preside.

Syria and Aviation Development

A NEW air service has been instituted in Syria between Latakia and Homs. Two journeys each way are, according to the Paris *Temps*, made per week, as on the similar services between Aleppo and Deir-Zor, Aleppo and Aintab, and Aleppo and Alexandretta. Services are also to be opened between Damascus and Palmyra and Damascus and Soweida (Hauran). A number of packages were carried on the Levant services, and in November 31 wounded or sick were evacuated by aeroplane without accident.

The London Aero-Models Association

A GENERAL meeting of the above Association was held on Thursday, January 5, at 20, Great Windmill Street, Piccadilly, W. 1, when 29 members had the pleasure of listening to a very interesting lecture by Mr. F. J. Camm on the subject of gears. A general debate followed, many members joining in. Messrs. W. G. Evans and Sons have very kindly presented a prize of £2 2s. to be competed for by the members during the coming flying season. An important general committee meeting will be held on Thursday, January 12. On January 19 all members are specially requested to attend a general meeting, when the election of the officers who will hold office for the ensuing twelve months will take place, and other business will be discussed.

Meetings are held every Thursday, at 20, Great Windmill Street, Piccadilly, W. 1, commencing at 7.30 p.m. prompt. Membership forms can be had from the Hon. Sec., Mr. A. E. Jones, 48, Narcissus Road, West Hampstead, N.W. 6.

SIDE-WINDS

FROM the other side of the Atlantic comes quite an interesting little pamphlet, entitled the "Text Book of Aeronautical Lubrication." It is published by the C. L. Maguire Petroleum Co., of Chicago, one of the "big" lubricating oil, etc., concerns of America, and the makers of "Lakeside Aviation Oil." The first half of this work is devoted to the qualities of the above oil, and to lubrication problems (aviatic) in general, whilst the second half consists of a very comprehensive "chart" of troubles experienced with aero-engines, their causes and remedies. Two interesting diagrams are also included, showing an aero-engine (Hall Scott) with the lubrication of all the important parts graphically set out.

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THE second annual Martlesham Heath Reunion Dinner (tickets 17*s.* 6*d.* each) will be held on Friday, January 20, at the Café Royal, Regent Street, London, W., at 7 p.m., when the Chair will be taken by Brig.-Gen. R. K. Bagnall-Wild, C.M.G., C.B.E.

Will all former members of the Station, please communicate with Capt. P. G. Robinson, Room A. 139, Air Ministry, London, W.C.2 ?

PUBLICATIONS RECEIVED

Technical Note No. 75. Effects of Varying the Relative Vertical Position of Wing and Fuselage. By L. Prandtl. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Report No. 118. The Pressure Distribution over the Horizontal Tail Surfaces of an Airplane. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 76. A Mechanical Device for Illustrating Airplane Stability. By F. E. Norton. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919
Published January 12, 1922

32,115. BARON R. DE T'SERCLAES. Rotary explosion engines.. (172,663.)

APPLIED FOR IN 1920
Published January 12, 1922

15,521. J. DEMOCRATIS. Parachutes. (172,670.)
15,964 and 15,965. DAYTON-WRIGHT Co. I.C. engines. (146,944 and 145,409.)
19,298. H. JUNKERS. I.C. engines. (147,219.)

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